

WHAT IS CLAIMED IS:

1. A background replacing apparatus comprising:

an image obtaining section that obtains a

5 plurality of photographic images generated through  
photography of a common subject under a plurality of  
photographic conditions;

an area discriminating section that discriminates  
among a subject area, a background area, and a boundary  
10 area of the photographic image in accordance with at least  
one of the photographic images obtained by the image  
obtaining section;

a mixing ratio determining section that determines  
a mixing ratio of a subject color to a background color in  
15 the boundary area; and

a background replacing section that replaces a  
background of the photographic image obtained by the image  
obtaining section with a different background in accordance  
with three areas of the subject area, the background area,  
20 and the boundary area, which are discriminated by the area  
discriminating section, and the mixing ratio determined by  
the mixing ratio determining section.

2. A background replacing apparatus according to

25 claim 1, wherein the area discriminating section  
discriminates among the subject area, the background area,  
and the boundary area of the photographic image in

accordance with a predetermined different point between the subject and the background in the photographic conditions.

3. A background replacing apparatus according to  
5 claim 1, wherein the area discriminating section  
discriminates the photographic image between a subject-side  
area and a background-side area in accordance with a  
predetermined different point between the subject and the  
background in the photographic conditions, and at least one  
10 of the subject-side area and the background-side area is  
reduced so as to be treated as the subject area and the  
background area, and an area between the subject area and  
the background area is treated as the boundary area.

15 4. A background replacing apparatus according to  
claim 1, wherein the area discriminating section  
discriminates the photographic image between a subject-side  
area and a background-side area in accordance with a  
predetermined different point between the subject and the  
background in the photographic conditions, and the subject-  
20 side area is reduced so as to be treated as the subject  
area, and an area portion excepting the subject area, of  
the subject-side area before reduction, is treated as whole  
or part of the boundary area.

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5. A background replacing apparatus according to  
claim 1, wherein the area discriminating section

discriminates the photographic image between a subject-side area and a background-side area in accordance with a predetermined different point between the subject and the background in the photographic conditions, and the  
5 background-side area is reduced so as to be treated as the background area, and an area portion excepting the background area, of the background-side area before reduction, is treated as whole or part of the boundary area.

10                 6. A background replacing apparatus according to claim 1, wherein the area discriminating section discriminates among the subject area, the background area, and the boundary area of the photographic image in accordance with one of the photographic images obtained by  
15 the image obtaining section, and

the background replacing section replaces a background of a photographic image, which is different from the photographic image used for discrimination of areas by the area discriminating section, of the photographic images  
20 obtained by the image obtaining section.

7. A background replacing apparatus according to claim 1, wherein the mixing ratio determining section presumes the subject color and the mixing ratio in the  
25 boundary area of the photographic image; and

the background replacing section replaces the background of the photographic image with the different

background using the subject color and the mixing ratio, which are presumed by the mixing ratio determining section.

5        8. A background replacing apparatus according to  
claim 7, wherein the mixing ratio determining section  
presumes the subject color using colors in the subject area  
as candidates for the subject color.

10      9. A background replacing apparatus according to  
claim 7, wherein the mixing ratio determining section  
presumes the subject color and the mixing ratio on  
individual points in the boundary area, and presumes the  
subject color on assumption that the subject color lines up  
on a straight line basis with the background color and a  
15      color of the associated point in a predetermined color  
space.

20      10. A background replacing apparatus according to  
claim 7, wherein the mixing ratio determining section  
presumes the subject color and the mixing ratio on  
individual points in the boundary area, and presumes the  
subject color, using colors in the subject area as  
candidates for the subject color, in such a manner that of  
the candidates, a candidate, which lines up on a straight  
25      line basis with the background color and a color of the  
associated point in a predetermined color space, and is  
closest to the color of the associated point, is presumed

as the subject color.

11. A background replacing apparatus according to  
claim 7, wherein the mixing ratio determining section  
5 presumes the subject color and the mixing ratio on  
individual points in the boundary area, and presumes the  
mixing ratio in accordance with a ratio of a mutual  
distance among the background color, a color of the  
associated point, and the subject color, in a predetermined  
10 color space.

12. A background replacing apparatus according to  
claim 7, wherein the background replacing section replaces  
the background of the photographic image with the different  
15 background in such a manner that a color of the different  
background and the subject color presumed by the mixing  
ratio determining section are mixed at the mixing ratio  
presumed by the mixing ratio determining section.

20 13. A background replacing apparatus according to  
claim 1, wherein the background replacing apparatus further  
comprises an image correcting section performs correction  
of the area discriminated by the area discriminating  
section in response to an operation, and causes the  
25 background replacing section to perform the background  
replacing based on a corrected area so that a background  
replaced image is corrected.

14. A background replacing apparatus according to  
claim 13, wherein the area discriminating section  
discriminates the photographic image between a subject-side  
5 area and a background-side area in accordance with a  
predetermined different point between the subject and the  
background in the photographic conditions, and the subject-  
side area and the background-side area are reduced by a  
predetermined reduction amount so as to be treated as the  
10 subject area and the background area, and

the image correcting section alters the reduction  
amount on the area discriminating section in response to an  
operation, so that the subject area and/or the background  
area are corrected.

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15. A background replacing apparatus according to  
claim 13, wherein the area discriminating section  
discriminates between the subject area and the background  
area in accordance with a discrimination basis based on a  
20 predetermined different point between the subject and the  
background in the photographic conditions, and

the image correcting section alters the  
discrimination basis in response to an operation, so that  
the subject area and/or the background area are corrected.

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16. A background replacing apparatus comprising:  
an image obtaining section that obtains a

plurality of photographic images generated through  
photography of a common subject under a plurality of  
photographic conditions;

an area discriminating section that discriminates  
5 a background area of the photographic image from other  
areas in accordance with at least one of the photographic  
images obtained by the image obtaining section;

10 a mixing state presuming section that presumes a  
mixing ratio of a subject color and a background color in  
other areas excepting the background area in the  
photographic image, and the subject color; and

15 a background replacing section that replaces a  
background of the photographic image obtained by the image  
obtaining section with a different background using the  
subject color and the mixing ratio, which are presumed by  
the mixing state presuming section.

17. A background replacing apparatus according to  
claim 16, wherein the mixing state presuming section  
20 presumes the subject color using colors in the subject area  
as candidates for the subject color.

18. A background replacing apparatus according to  
claim 16, wherein the mixing state presuming section  
25 presumes the subject color and the mixing ratio on  
individual points in other areas excepting the background  
area, and presumes the subject color on assumption that the

subject color lines up on a straight line basis with the background color and a color of the associated point in a predetermined color space.

5           19. A background replacing apparatus according to  
claim 16, wherein the mixing state presuming section  
presumes the subject color and the mixing ratio on  
individual points in other areas excepting the background  
area, and presumes the subject color, using colors in other  
10          areas excepting the background area as candidates for the  
subject color, in such a manner that of the candidates, a  
candidate, which lines up on a straight line basis with the  
background color and a color of the associated point in a  
predetermined color space, and is farthest from the color  
15          of the associated point, is presumed as the subject color.

20          20. A background replacing apparatus according to  
claim 16, wherein the mixing state presuming section  
presumes the subject color and the mixing ratio on  
individual points in other areas excepting the background  
area, and presumes the mixing ratio in accordance with a  
ratio of a mutual distance among the background color, a  
color of the associated point, and the subject color, in a  
predetermined color space.

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21. A background replacing apparatus according to  
claim 16, wherein the background replacing section replaces

the background of the photographic image with the different background in such a manner that a color of the different background and the subject color presumed by the mixing state presuming section are mixed at the mixing ratio

5 presumed by the mixing state presuming section.

22. A background replacing apparatus according to claim 16, wherein the area discriminating section discriminates a background area of the photographic image from other areas in accordance with a ratio of luminous 10 intensity among the plural photographic images.

23. A background replacing apparatus according to claim 16, further comprising a storage section that stores 15 the subject color and the mixing ratio, which are presumed by the mixing state presuming section,

wherein the background replacing section replaces a background of the photographic image obtained by the image obtaining section with a different background using 20 the subject color and the mixing ratio, which are stored in the storage section.

24. A background replacing apparatus according to claim 16, further comprising a first parameter determining 25 section that determines a correction parameter to be used for a color correction for the subject color in accordance with an image of said other area in which a color is

replaced by the subject color presumed in the mixing state presuming section, and

5 a first color correcting section that applies the color correction to the subject color, which is presumed by the mixing state presuming section, using the correction parameter determined by the first parameter determining section,

10 wherein the background replacing section replaces the background of the photographic image obtained by the image obtaining section with a different background using the subject color subjected to the color correction by the first color correcting section and the mixing ratio.

15 25. A background replacing apparatus according to claim 16, further comprising a second parameter determining section that determines a correction parameter to be used for a color correction for the subject color in accordance with the photographic image obtained by the image obtaining section, and

20 a second color correcting section that applies the color correction to the subject color, which is presumed by the mixing state presuming section, using the correction parameter determined by the second parameter determining section,

25 wherein the background replacing section replaces the background of the photographic image obtained by the image obtaining section with a different background using

the subject color subjected to the color correction by the second color correcting section and the mixing ratio.

26. A background replacing apparatus according to  
5 claim 16, further comprising a third parameter determining section that determines a correction parameter to be used for a color correction for the subject color to a parameter according to an operation, and

10 a third color correcting section that applies the color correction to the subject color, which is presumed by the mixing state presuming section, using the correction parameter determined by the third parameter determining section,

15 wherein the background replacing section replaces the background of the photographic image obtained by the image obtaining section with a different background using the subject color subjected to the color correction by the third color correcting section and the mixing ratio.

20 27. A background replacing apparatus according to  
claim 16, further comprising a fourth parameter determining section that determines a correction parameter to be used for a color correction for the subject color to a parameter according to the different background, and

25 a fourth color correcting section that applies the color correction to the subject color, which is presumed by the mixing state presuming section, using the correction

parameter determined by the fourth parameter determining section,

wherein the background replacing section replaces the background of the photographic image obtained by the 5 image obtaining section with the different background using the subject color subjected to the color correction by the fourth color correcting section and the mixing ratio.

28. A background replacing apparatus according to 10 claim 16, wherein the background replacing section replaces a background of the photographic image using, as the different background, a background to which relation information representative of a relative positional relation in an image between the subject and the background 15 is applied, and performs an replacement in such a manner that the relative relation in the background replaced image between the subject and the background is the same relative relation as the relative relation represented by the relation information.

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29. A background replacing apparatus comprising: an image obtaining section that obtains a plurality of photographic images generated through photography of a common subject under a plurality of 25 photographic conditions mutually different in color of the background;

an area discriminating section that discriminates

a background area of the photographic image from other areas in accordance with the photographic images obtained by the image obtaining section;

5 a mixing state presuming section that presumes a mixing ratio of the subject color to the background color, and the subject color, in other areas excepting the background area in the photographic image, in accordance with the plurality of photographic images; and

10 a background replacing section that replaces a background of the photographic image obtained by the image obtaining section with a different background using the subject color and the mixing ratio, which are presumed by the mixing state presuming section.

15 30. A background replacing apparatus according to claim 29, wherein the mixing state presuming section presumes, on assumption that the plurality of photographic images are equal to each other in terms of mixing state of the subject color and the background color, the subject color and the mixing ratio.

20 31. A background replacing apparatus according to claim 19, wherein the mixing state presuming section presumes the subject color and the mixing ratio on individual points in other area excepting the background area, determines straight lines each coupling in a predetermined color space the background color with a color

of the associated point in each of the plurality of photographic images generated through photography of the common subject under a plurality of photographic conditions mutually different in color of the background, and presumes  
5 a color corresponding to an intersection of the straight lines as the subject color.

32. A background replacing apparatus according to  
claim 29, wherein the image obtaining section obtains a  
10 plurality of photographic images generated through  
photography of the common subject under a plurality of  
photographic conditions mutually different in color-phase  
of the background.

15 33. A background replacing apparatus according to  
claim 29, wherein the area discriminating section  
discriminates between a subject area and a boundary area of  
other areas excepting the background area in the  
photographic image; and

20 the mixing state presuming section that presumes  
the subject color and the mixing ratio in the boundary area.

34. A background replacing apparatus according to  
claim 29, wherein the area discriminating section  
25 discriminates the background area of the photographic image  
obtained by the image obtaining section from other areas in  
accordance with an amount of the change in color among the

plurality of photographic images.

35. A background replacing apparatus according to  
claim 29, wherein the area discriminating section  
5 discriminates the background area of the photographic image  
obtained by the image obtaining section from other areas in  
accordance with a difference of luminous intensity between  
the background and the subject.

10 36. A background replacing program that causes a  
computer to operate as an apparatus, when the background  
replacing program is incorporated into the computer and is  
executed, the apparatus comprising:

15 an image obtaining section that obtains a  
plurality of photographic images generated through  
photography of a common subject under a plurality of  
photographic conditions;

20 an area discriminating section that discriminates  
among a subject area, a background area, and a boundary  
area of the photographic image in accordance with the  
photographic images obtained by the image obtaining  
section;

25 a mixing ratio determining section that determines  
a mixing ratio of a subject color to a background color in  
the boundary area; and

a background replacing section that replaces a  
background of the photographic image obtained by the image

obtaining section with a different background in accordance with three areas of the subject area, the background area, and the boundary area, which are discriminated by the area discriminating section, and the mixing ratio determined by 5 the mixing ratio determining section.

37. A background replacing program that causes a computer to operate as an apparatus, when the background replacing program is incorporated into the computer and is 10 executed, the apparatus comprising:

an image obtaining section that obtains a plurality of photographic images generated through photography of a common subject under a plurality of photographic conditions;

15 an area discriminating section that discriminates a background area of the photographic image from other areas in accordance with the photographic images obtained by the image obtaining section;

20 a mixing state presuming section that presumes a mixing ratio of the subject color and the background color, and the subject color, in other areas excepting the background area in the photographic image; and

25 a background replacing section that replaces a background of the photographic image obtained by the image obtaining section with a different background using the subject color and the mixing ratio, which are presumed by the mixing state presuming section.

38. A background replacing program that causes a computer to operate as an apparatus, when the background replacing program is incorporated into the computer and is 5 executed, the apparatus comprising:

an image obtaining section that obtains a plurality of photographic images generated through photography of a common subject under a plurality of photographic conditions in which colors of backgrounds are 10 different from one another;

an area discriminating section that discriminates a background area of the photographic image from other areas in accordance with the photographic images obtained by the image obtaining section;

15 a mixing state presuming section that presumes a mixing ratio of the subject color and the background color, and the subject color, in other areas excepting the background area in the photographic image, in accordance with the plurality of photographic images; and

20 a background replacing section that replaces a background of the photographic image obtained by the image obtaining section with a different background using the subject color and the mixing ratio, which are presumed by the mixing state presuming section.

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39. A background replacing method comprising:

an image obtaining step that obtains a plurality

of photographic images generated through photography of a common subject under a plurality of photographic conditions;

an area discriminating step that discriminates among a subject area, a background area, and a boundary area of the photographic image in accordance with the photographic images obtained by the image obtaining step;

a mixing ratio determining step that determines a mixing ratio of a subject color to a background color in the boundary area; and

a background replacing step that replaces a background of the photographic image obtained by the image obtaining step with a different background in accordance with three areas of the subject area, the background area, and the boundary area, which are discriminated by the area discriminating step, and the mixing ratio determined by the mixing ratio determining step.

40. A background replacing method comprising:

an image obtaining step that obtains a plurality of photographic images generated through photography of a common subject under a plurality of photographic conditions;

an area discriminating step that discriminates a background area of the photographic image from other areas in accordance with the photographic images obtained by the image obtaining step;

a mixing state presuming step that presumes a mixing ratio of a subject color and a background color, and the subject color, in other areas excepting the background area in the photographic image; and

5 a background replacing step that replaces a background of the photographic image obtained by the image obtaining step with a different background using the subject color and the mixing ratio, which are presumed by the mixing state presuming step.

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41. A background replacing method comprising:  
an image obtaining step that obtains a plurality of photographic images generated through photography of a common subject under a plurality of photographic conditions;

15 an area discriminating step that distinguishes a background area of the photographic image from other areas in accordance with the photographic images obtained by the image obtaining step;

20 a mixing state presuming step that presumes a mixing ratio of a subject color and a background color, and the subject color, in other areas excepting the background area in the photographic image, in accordance with the plurality of photographic images; and

25 a background replacing step that replaces a background of the photographic image obtained by the image obtaining step with a different background using the

subject color and the mixing ratio, which are presumed by the mixing state presuming step.